

Citizen science programs provide valuable data towards the conservation and management of natural resources in the Monterey Bay National Marine Sanctuary

The Monterey Bay attracts world-class scientists and citizen scientists eager to participate in the collection of baseline data. The Monterey Bay National Marine Sanctuary's (MBNMS) five citizen science programs provide valuable services toward management and conservation of resources: public outreach and resource protection via kayaker naturalists (Team OCEAN); outreach to coastal visitors (Bay Net); collection of baseline data to assist in the detection of mortality events (BeachCOMBERS); collection of standardized water quality data at outfalls (First Flush); collection of water quality data in creek and rivers (Snapshot Day); and detection of pollutants in urban areas (Urban Watch). These programs are managed in part by MBNMS and partners including Coastal Watershed Council, MLML and CDFG-OSPR. In 2010, Beach COMBERS volunteers walked a cumulative 2,014 km during 288 monthly surveys from Santa Cruz to San Luis Obispo Counties and helped identify two unusual mortality events (one involving California sea lion (*Zalophus californianus*) and another of Northern Fulmar (*Fulmarus glacialis*)); First Flush volunteers collected storm water samples from 58 outfall sites from San Mateo County to Monterey County; Urban Watch volunteers assisted coastal cities in detection of urban pollutants including a chlorine spill in the city of Monterey; Team OCEAN volunteers helped to quantify the number and severity of 120 observed marine mammal disturbances. In 2010, these programs cumulatively provided the MBNMS with 4,470 hours of time at a value of \$104,106. Three of the programs are highlighted below.

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Snapshot Day

Snapshot Day is the oldest and largest single-day, water-quality monitoring event of its kind in California. Since its inception in 2000, Snapshot Day was designed to increase public awareness by providing a "snapshot" of regional water quality conditions and to provide resource managers with valuable information for reducing pollution. On Snapshot Day, hundreds of volunteers collect water quality samples from rivers and streams in California's coastal watersheds, including the 10 major watersheds that drain into the Monterey Bay National Marine Sanctuary. Snapshot Day volunteers span the shoreline boundary of the MBNMS and beyond, collecting samples from Morro Bay to Pacifica, a shoreline distance of almost 250 miles.

Methods:

- Snapshot Day volunteers are assigned 2-9 stream or river sites.
- Field measurements for pH, temperature, dissolved oxygen, transparency/turbidity.
- Grab samples that are lab tested for *E. coli*, nitrate, and orthophosphate.



Figure 1. Snapshot Day Volunteers at: Big Sur, Natividad Creek, reclamation ditch in Salinas.

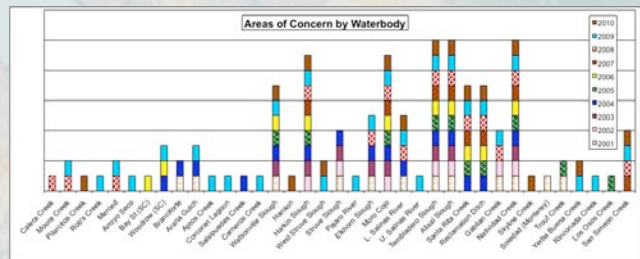


Figure 2. Areas of Concern by watershed. Sites with three or more parameters that exceed water quality objectives are listed as Areas of Concern

Results: Each year Snapshot Day data is compiled and analyzed to determine Areas of Concern. These areas are waterbodies that have an exceedance of the water quality objectives for any three analytes measured. Areas of Concern can be based on lab and/or field data. In 2010, 26 sites in 15 waterbodies were listed as Areas of Concern (Figure 2). By identifying Areas of Concern resource managers can focus efforts to alleviate problems.

Volunteers play a crucial role in Snapshot Day monitoring: In 2010, 202 volunteers monitored 192 sites along the central California coastline for a combined total of 1,010 hours at a value of \$23,523.

Coastal Ocean Marine Bird and Mammal Education and Research Surveys (BeachCOMBERS)

The Coastal Ocean Marine Bird and Mammal Education and Research Surveys (BeachCOMBERS) program has conducted monthly surveys to monitor changes in the deposition of beached birds and mammals who serve as "citizen scientists," collecting valuable information in a standard manner to provide important information about the status of marine birds and mammals in the sanctuary. We use standardized survey methods to obtain baseline rates of seabird and marine mammal deposition (carcass km⁻¹ month⁻¹) on local beaches, and to identify unusual mortality events.

Methods:

- Two observers per beach.
- Same survey segments each month (Figure 1).
- Volunteers are trained to identify marine birds and mammals.
- Standard datasheets.
- Birds marked to avoid double-counting.



Figure 1. Map of beaches walked by BeachCOMBERS volunteers on a monthly basis. Beaches are located in Santa Cruz, Monterey and San Luis Obispo Counties. Core beaches are beach numbers 1-11.

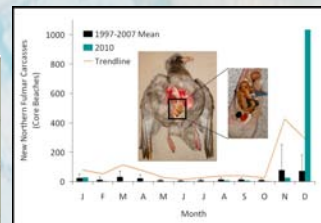


Figure 2. Number of new northern fulmar carcasses observed during beach surveys. The trendline (TL) indicates the 10-year mean + 1SD. Values greater than the TL indicate an unusual mortality event (UME). Fulmars are a regular winter migrants in central CA, yet in some years large numbers strand on beaches. Significant die-offs of northern fulmars (wrecks) are not uncommon during winter months. Although NOFU conservation issues include fishery bycatch, oiling, plastic ingestion, and introduced predators on nesting islands, populations are thought to be relatively robust, so little to no conservation measures currently are occurring. Necropsies of northern fulmars often reveal a stomach full of plastic (see photo). Plastic ingestion by northern fulmars (and other tubenose seabirds) is a common occurrence in the Pacific Ocean.

Results:

During 2010, BeachCOMBERS volunteers:

- Conducted 288 surveys and walked a cumulative 2,014 km.
- Contributed 969 hours while conducting surveys, training and travel time to and from sites (valued at \$22,568).
- Helped identify an unusual mortality event (UME) for California sea lions (*Zalophus californianus*) and northern fulmars (*Fulmarus glacialis*; Figure 2).

Team OCEAN Kayaker Outreach Program

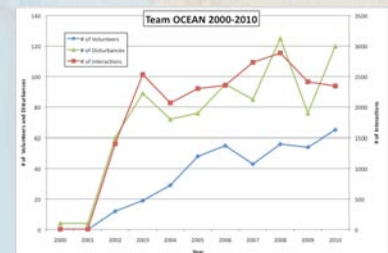
Intro: Team OCEAN provides on-the-water interpretation of local wildlife for kayakers, boaters, divers, and beachgoers. Team OCEAN volunteers talk with other kayakers in order to engage in conversations about the MBNMS, local wildlife, natural history and proper wildlife viewing techniques for three sensitive marine mammal species (southern sea otters, harbor seals, and California sea lions). Discussions focus on keeping a good distance and reducing noise levels around these sensitive marine wildlife. Team OCEAN volunteers kayak in two areas within the MBNMS- off Cannery Row in Monterey and in Elkhorn Slough in Moss Landing.

Methods:

- Kayak three days per week (Friday, Saturday and Sunday)- 4.5 hours on the water.
- Data on observed disturbances, species involved, and number of individuals.
- Record the number of interactions with visitors.

2010 Results:

- Volunteers observed 120 disturbances of one of three local marine mammal species- southern sea otters, California Sea Lions, or harbor seals.
- Prevented 146 disturbances.
- Contacted 6,147 people (over 58,000 since 2000).
- Volunteers donated 1110 hours at a value of \$25,851.90. Since 2000, 8007 hours have been donated at a value of \$186,483.



Acknowledgements: Thank you to all of the Monterey Bay National Marine Sanctuary volunteers for the invaluable data you collect that helps us monitor the pulse of the sanctuary!